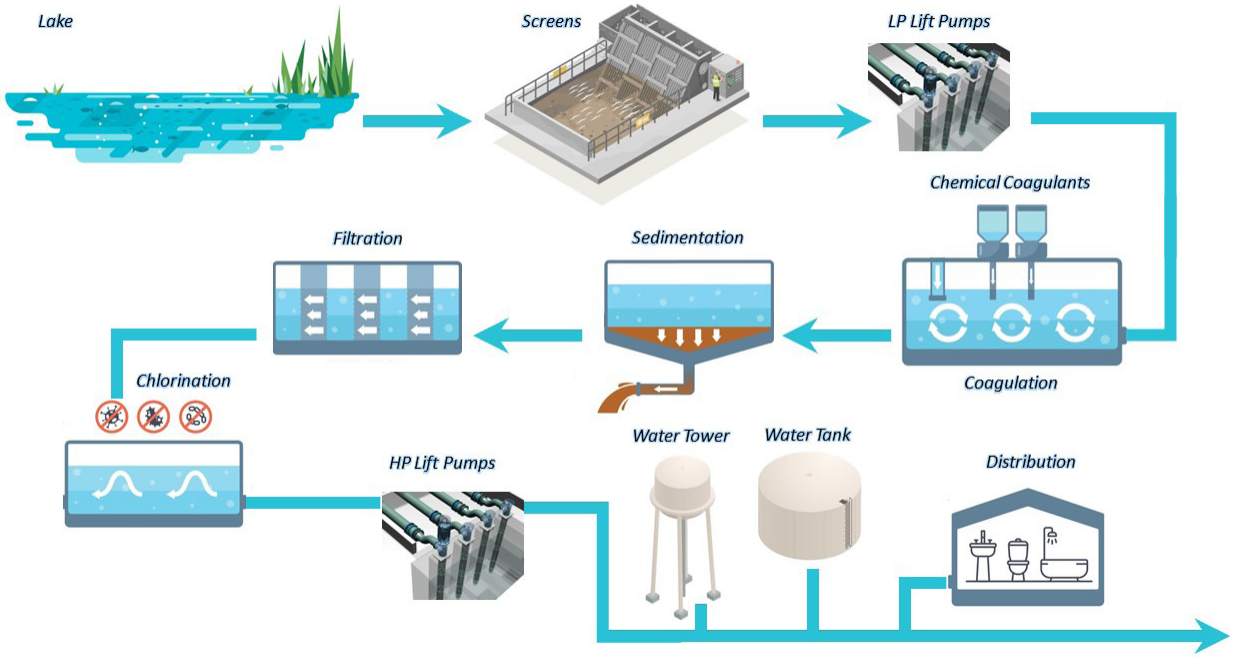
Vibration Monitoring of Water Treatment Plants

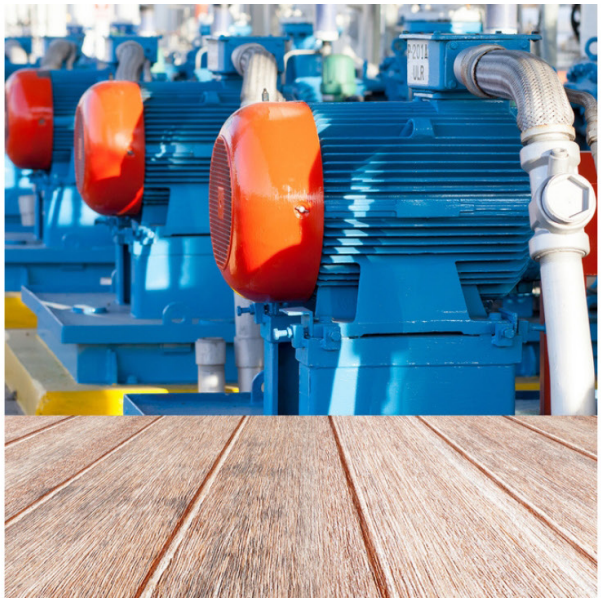
Rotating machinery at a Water Treatment Plant should be monitored to enable proactive maintenance, reduce downtime, increase equipment lifespan, and improve operational efficiency by identifying potential issues before they escalate into major problems.

Water Treatment Plants are facilities that treat water to make it safe for human consumption and other uses. The process of water treatment involves several steps that remove impurities and contaminants from the water. Usually, gravity is used to help convey the water to the treatment plant, in many cases lift pumps need to be used to move the water from a lake or river to where the water can be treated in a treatment facility. The size of the lift pumps is determined by the flow volume and the pressure head necessary to deliver the water. The bearings for the lift pumps are either going to be Rolling Element Bearings or Fluid Film Bearings depending upon the size of the pump. Large pumps, over 1 megawatt, usually have Fluid Film Bearings.

In the water treatment process, the first step is to remove any physical objects and large particles from the stream. This starts in a screening process and may involve conveyors. The conveyor motors should be monitored with velocity transmitters on the load side bearing to help ensure that the debris does not cause a problem with the conveyor. The next step is to remove the dissolved solids suspended in the water. To speed up the settling and removal process, chemicals called coagulants are added to



Typical Water Treatment Plant


the water. The most common coagulant is aluminum sulfate, but this varies by the Water Treatment Plant. Essentially this chemical has the opposite charge from the suspended solids, like clays or silts, which then neutralizes the charge and allows for the particles to stick together. In the coagulation basin the solids in the water begin sticking together, the mixture is slowly mixed and moves to the flocculation basin in order to continue to form what are called floc particles. The motors for the coagulation and the flocculation mixers are slow moving, usually, rolling element bearing machines. These machines should be monitored per the Hydraulic Institutes Guidelines 9.6.4 for machines operating less than 600 rpm, using seismic velocity transmitters measuring vibration velocity and integrated displacement.

Monitoring the vibration allows for any degradation to be noticed, and maintenance to be planned in advance of machine failure. The floc particles then settle out of the mixture in a sedimentation basin, and cleaner water flows overtop a weir. This process is only the first step, and it has mainly removed larger particles in the water, but some smaller particles may remain, as well as chemicals and bacteria. Following sedimentation, the next step is typically filtration through a sand filter. Sand filters have been used since the beginning of water treatment, and they are required most everywhere to be included in the treatment process to assure a standard level of clarity.

Sand filters are used as a step in the water treatment process of water purification. There are three main types; rapid (gravity) sand filters, upward flow sand filters and slow sand filters. All three methods are used extensively in the water industry throughout the world. Sand filtration works by using multiple layers of specialized sand and gravitational fluid pressure to retain solid particles suspended in liquids, resulting in a cleaner product. As fluids pass slowly though layered sand and gravel beds, natural physical, biological, and chemical processes combine to provide treatment. Gravity is often used to move the water through the sand filter beds, however, is some higher flow or demand situations, pumps are often used to force the flow through the beds. Pumps are also used to force water to back flush the beds to clean them and allow for their continued use. These pumps are usually employing rolling element bearings and are monitored with velocity transmitters. On larger pumps, greater than 1 megawatt, fluid film bearings are used necessitating the need for proximity sensors for proper monitoring.

It should be noted that, anthracite is a type of coal that is used in water filtration systems. It is used as a filter medium in dual media filters with sand as the other medium. Anthracite is used to remove smaller particles from water than sand alone can remove. At the end of the process chlorine is added as a disinfectant, it kills any organisms that have not been removed in the filtration process.

Why is vibration monitoring of water plants needed?

Vibration monitoring is crucial in water plants for several reasons. These plants house equipment and machinery that are essential for the treatment and processing of water. Monitoring vibration helps ensure the smooth and efficient operation of these facilities, as well as the safety of personnel and the environment. Here are some key reasons why vibration monitoring is essential:

- Equipment Health and Condition Monitoring
- Early Fault Detection
- Energy Efficiency
- Process Optimization
- Environmental Protection
- Personnel Safety
- Regulatory Compliance
- Asset Management and Longevity

Why Monitor…	Realized Business Value
Avoid Catastrophic Failure	Reduce Capital & Maintenance Spend
Manage & Plan Maintenance	Reduce Maintenance Spend & Meet Budget
Decrease Unplanned Downtime	Meet Production & Revenue Targets
Improve Machine Efficiency	Reduce Energy Costs
Optimize Work Tasks	Deploy Resources on Value-Added Tasks



Why Vibration Monitoring is Needed

How is vibration monitoring used in water industries?

Vibration monitoring plays a crucial role in the water industries by helping to ensure the reliable and efficient operation of equipment and infrastructure. Here are some ways in which vibration monitoring is used in these industries:

- Pump and Motor Monitoring
- Pipe and Valve Monitoring
- Mixing and Agitation Equipment
- Structural Monitoring

What are the challenges in vibration monitoring of water plants?

While vibration monitoring offers numerous benefits in water plants, there are also several challenges that need to be addressed. Here are some common challenges associated with vibration monitoring in these industries:

- Harsh Environment
- Sensor and or Transmitter Placement
- Data Interpretation
- Integration with Maintenance Strategies
- Cost Considerations

Addressing these challenges requires a combination of appropriate technology, expertise, and effective implementation strategies. By overcoming these obstacles, water plants can optimize their maintenance practices, improve equipment reliability, and ensure the efficient operation of their facilities.

What solutions do we advocate for vibration monitoring of water plants?

Some general solutions that are commonly advocated for vibration monitoring in water plants are noted below. These solutions can help optimize the vibration monitoring process:

- Robust Vibration Sensors and Transmitters
- Wireless Monitoring Systems
- Advanced Signal Processing and Analysis
- Remote Monitoring and Analytics
- Integration with Maintenance Management Systems
- Expert Support and Training

Conclusion

Overall, vibration monitoring in the water industries enables proactive maintenance, reduces downtime, increases equipment lifespan, and improves operational efficiency by identifying potential issues before they escalate into major failures.

It's advisable to consult with vibration monitoring solution providers, such as Metrix Vibration or other reputable companies in the industry, to understand their specific offerings and how they align with the unique requirements of your water plant.

In conclusion, vibration monitoring is a proactive approach to maintain the operational efficiency, safety, and environmental integrity of Water Treatment Plants. It allows for early detection of equipment issues, optimized processes, and overall, more sustainable, and reliable plant operations.

Why Metrix…	Impact to Business Value
Application Expertise	An Investment in Metrix Includes Consultation on Applications and Proven Monitoring Strategies
Scalable Monitoring	Pay for Solutions to Address Current Needs & Expand Monitoring if Needs Evolve
Decreased Investment	Metrix Leverages Your Existing Control System – No Standalone Monitoring System Needed
Minimized Complexity	Metrix Provides Intuitive Monitoring Instruments & Tools To Enable You To Install & Maintain
Best In Class Delivery & Lead Time	On Time Delivery and Short Lead Times Reduce Machinery Down Time



Why Metrix for Vibration Monitoring

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